MEETING MINUTES
ENVIRONMENTAL EVALUATIONS FOR OPERABLE UNITS 5, 6, AND 7
ROCKY FLATS PLANT, GOLDEN, COLORADO

Monday, April 19, 1993

These minutes summarize questions, responses, and comments from participants at the OU5/6/7 Environmental Evaluation (EE) status presentation to the U.S. Environmental Protection Agency (EPA) and Colorado Department of Health (CDH) by Dr. Mark Lewis of The S.M. Stoller Corporation on behalf of EG&G Rocky Flats, Inc., and the U.S. Department of Energy (DOE). These minutes are not intended to represent a verbatim transcription. A list of attendees and a set of handouts are provided as attachments.

Bonnie Lavelle (EPA) called the meeting to order shortly after 0900.

Pete Laurin (EG&G) opened by stating that the purpose of the meeting was to describe the status of the OU5/6/7 EEs, discuss near-term aspects, and to maintain open communications between EG&G/DOE and the regulatory agencies.

Attendees introduced themselves (see attached list).

Mark Lewis (Stoller) stated that the presentation would focus on OU6 (Walnut Creek), which geographically encompasses OU7 (Present Landfill).

Allen Crockett (Stoller) suggested that Mark specifically describe any aspects of the OU6 EE that differ from those for OU7 and OU5 (Woman Creek).

Mark Lewis basically followed his handout throughout most of the presentation (see attached). He began by describing the "problem formulation" phase as defined by EPA's "Framework for Ecological Risk Assessment." This phase includes review of available data, identification of probably exposure pathways, contaminants, etc., identification of objectives and measurement endpoints, and development of a sampling plan. Community (ecological) data and biota tissue samples were collected in fall 1992, but more aquatic samples are needed this spring because of limited success in catching fish with either gill nets or minnow traps. Mark then described the EE work plan framework.

Bonnie asked for clarification of ecological versus ecotoxicological field work.

Mark described that they are accomplished in parallel.

Bonnie stated that this approach made her nervous.

Mark responded that the "nature and extent" abiotic sampling programs are very comprehensive in their target analytes.

ADMIN RECORD

DATE 7-12-93

Bonnie then asked if preliminary Contaminants of Concern (COC) lists are based on the Remedial Investigation (RI) data.

Mark responded in the negative -- no, because those data are not yet available. Preliminary COCs are based on existing information from earlier OU-specific or sitewide investigations.

Jeb Love (CDH) pointed out that this was discussed previously during development of the OU5 work plan.

Mark discussed the concept that, at RFP, the OUs are source- rather than effects-driven (versus Rocky Mountain Arsenal, where wildlife mortality was an issue.) He also described primary and secondary sources for the three OUs. Surface water transport is the major mechanism for OUs 5 and 6; wind dispersal is a potentially important mechanism for OU7.

Bonnie asked whether reference areas were used to define effects.

Mark answered that they were used as a basis for evaluating communities and tissue data for the OU study areas but not to define possible effects.

Mark described the EE approach, which includes a screening-level risk assessment, development of a preliminary COC list, and measurement of ecological and abiotic media endpoints.

Bonnie asked how target analytes were selected.

Mark described the process that starts with a general list based on existing information and leads to a specific list based on bioaccumulation and persistence.

Bill Fraser (EPA) questioned whether the sampling plan was followed because of inconsistencies between text and tables, lack of clarity between COCs and target analytes, and the presentation of results for PCBs.

Mark explained that Bruce Hope (former EG&G EE coordinator) had directed the collection and analysis of samples for PCBs because of their documented presence in areas upgradient of some OUs and the reduced cost of evaluating PCBs in biota as part of the EE process, even if they were not a COC for a given OU.

Bill suggested that the data for PCBs either be better explained or deleted.

Mark briefly mentioned abiotic sampling components of the EE process.

Mark then described assessment endpoints that are indicative of stress: decreased abundance, increased mortality, alteration of community structure, and gross toxicity of media. He added that, at RFP, the limited availability and flow of water limits the aquatic biota. Thus, the presence or absence of indicator species is an important endpoint for aquatic ecosystems.

An extended discussion ensued concerning the validity of the Rock Creek reference area for aquatics. It was eventually resolved that the Rock Creek reference area was better for toxicity and tissue data than for community data, and that the concept differs for ponds and stream segments.

Jeb Love agreed that the aquatic reference area concept was a difficult issue throughout the west because of manipulation of flows [and other management practices]. He stressed the importance of a baseline exposure assessment.

Bonnie asked whether radionuclides might cause an effect that was not addressed by the endpoints selected.

Mark responded that the endpoints are highly integrated measurements (i.e., sensitive to a wide range of possible effects).

Bonnie stated that she is still not comfortable because of a lack of abiotic data.

Mark stated that the EE process at RFP has three bases: exposure estimation, integration of ecological endpoints as indicators of stress, and toxicity testing.

Bonnie encouraged DOE/EG&G to open up communication to reach agreement on important issues.

Jeb speculated that aquatic organisms will be more sensitive indicators at RFP than terrestrial organisms, owing to a higher frequency and duration of exposure to contaminants.

Mark added that aquatic systems are integrated areally because a pond or stream site potentially includes contaminants originating throughout a much larger area [the drainage basin].

Bonnie asked if the storm-event sampling program is being coordinated with the EEs.

Several individuals answered in the affirmative.

Dr. Fred Harrington (EG&G) asked if the agencies agreed with the sampling protocols for the storm-event sampling.

General response -- yes.

Ed Mast (EG&G) said that ASI is ready to begin sampling with the next storm event.

Jeb talked about Phase I versus Phase II investigations and the importance of flow in stream environments.

Mark described the Conceptual Site Model (CSM) attached included with the handouts and emphasized that the CSM depicts exposure pathways and is not a detailed food web.

Mark then described exposure points: soils in IHSSs, downgradient soils, surface water, sediments, vegetation, and prey species [vertebrates and invertebrates].

Bill asked if the exposure endpoints are the same for the three OUs.

Mark answered "yes, generically" but noted that this will become better documented as the EEs progress. Mark also touched on uptake mechanisms (exposure routes) and bioconcentration from water and ingestion.

Mark discussed selection criteria for key receptors: position if food web, availability of life history data, availability of data pertaining to potential effects from exposure to OU-specific contaminants, and the existence of some sociological importance [e.g., special legal status or consumptive/recreational value].

Bonnie asked about difference between target taxa and key receptors.

Mark explained that target taxa will be sampled for contaminant loading, while some key receptors (e.g., uncommon, protected, or large organisms) will be assessed only by modeling. He added that the soil invertebrates will not include earthworms because of their absence or low abundance in habitats such as occur at RFP [this group is widely assessed in some other areas of the United States].

Fred noted that peregrine falcons should be added to the list of key receptors.

Mark and Bonnie discussed the source of information used in the exposure calculations. It was agreed that Mark would provide tabular summaries of the various sources. Bonnie noted that EPA is working on an exposure assessment guidance for wildlife [due out this fall].

Mark and Allen described the daily ingestion rate and site use factor components. These address the portion of time spent onsite or otherwise exposed to site contaminants, based either on areal extent or migratory behavior.

Bonnie asked questions about the basis for using these factors.

Mark responded that they come from EPA guidance documents.

Mark then discussed the issues of assimilation efficiency and biomagnification, which again are related to the concept of attempting to achieve reasonable exposure (and risk) estimates for specific contaminants, organisms, and exposure pathways.

Mark also discussed deterministic and probabilistic simulation modeling.

Jeb Love felt that Mark was "mixing apples and oranges" because he (Mark) talked about both media and tissues.

Mark responded that appropriate frequency distributions would be used in calculations and that the surface water variable in the equation under question referred to ingestion of surface water, not dermal absorption.

Bonnie asked if we will do a quantitative uncertainty analysis.

Mark responded that the question will be addressed because results of the modeling will be probabilistic and based on the actual distribution of contaminants at RFP. This will allow the evaluation of uncertainty and sensitivity.

Fred asked about the turnaround time for fish data.

Mark answered "about 45 days."

Bill Fraser asked for a summary of the current status, specifically regarding data.

Mark stated that toxicity data are back, ecological (community) data are being analyzed, and tissue data are not yet back from the laboratories. Mark estimated that we are about 30 percent completed based on results, and 50 percent completed based on schedule.

Bill asked how much "back-tracking" would be required if the agencies were to have a problem with any aspect of the EEs. He acknowledged that the agencies have committed to a course of action but stated that he is uncertain whether he agrees.

Mark responded that the target analyte suite for media and tissue is very conservative.

Bill wondered what would happen if we were to have "guessed wrong."

Mark said that the analyte list is more than adequate for metals; if follow-up studies were required for organics based on new data, then a focused design would be required.

Bill asked when we will know [about the adequacy of our approach].

Jeb answered, "September."

Ed Mast added that the last storm-event data would be available in mid-August (unvalidated).

Pete Laurin noted that EG&G is being driven by the Inter-Agency Agreement (IAG) schedule, and the at they have tried to be conservative but realistic.

Mark added that we conceivable could have to do more EE work later in the process.

Jeb asked if any tissue samples are being collected for fish.

Mark said, "Yes, if we catch them." Crayfish are also being sampled, but other benthic macroinvertebrates are not (owing to limited biomass.)

Fred said that fish may have been eliminated from ponds A-1 and A-2 in 1991 as a result of excessive pumping.

Jeb said that he is especially interested in the B-series ponds because some laboratory studies have shown that algae can concentrate plutonium by a factor of 50,000.

Mark said that this could be primarily by adsorption, data for higher trophic levels (fish) are better indicators of contaminant uptake and dispersal through the food web.

Bonnie asked that EG&G submit the results of a COC screening using RI data, values for the various exposure parameters, and life history information.

Bill said that the parties need to agree on the terms used in the COC criteria.

Bonnie recalled that EG&G and its consultants resisted using a firm numerical value for the criteria (OUs 1 and 2).

Bill asked, for example, how the terms "background", "hot spot", and "widely distributed" are defined.

Mark responded with the general definitions being used.

Bill said that problems may arise if CDH merely is provided data in 6 months with no opportunity for input.

Bonnie said that we need to move ahead, based on agreements forged as part of the process for OUs 1 and 2.

Bill cautioned not to leave issues to be resolved at the end.

Mark reiterated that the process is conservative whenever judgement is required.

Further discussion occurred on this general subject. The EPA/CDH consensus was that they want to see backup data and be given regular opportunities for input instead of being given information at the last minute.

Jeb said that EPA and CDH need to be specific about what types of data they need to see.

Tim O'Rourke (EG&G) said that he assumes the desire is to be able to justify the data and conclusions as being defensible.

Rick Roberts (EG&G) said that the EE process is playing catch-up relative to the Human Health Risk Assessment Process.

Bonnie adjourned the meeting at 1100.

Woodward-Clyde

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PROJECT NO. _____

PAGE NO. ____ OF ____ BY _____

Name	Company	Phone No.
Norma L. Castañeda	DOE/ERD	966-4226
Pete Lauria	EG&G	966-8702 ~~871-9729~~
Edward Mast	EG&G	966-8589
Rick Roberts	EG&G	966-8508
Tim P. O'Rourke	EG&G	966-8577
Bonnie Lavelle	EPA	294-1067
Bill Fraser	EPA	294-1081
Harlen Ainscough	CDH	692-3337
Terry Butler	PRC	295-1101
Jeb Love	CDH	692-3511
Fred Hurrington	EG&G	966-8744
Allen Crockett	Stoller	449-7220
Mark Lewis	Stoller	449-7220
Susan Buth	WCC	740-2787

MEETING AGENDA
PHASE I RFI/RI ENVIRONMENTAL EVALUATION
OPERABLE UNIT 6 -- WALNUT CREEK PRIORITY DRAINAGE
(April 19, 1993)

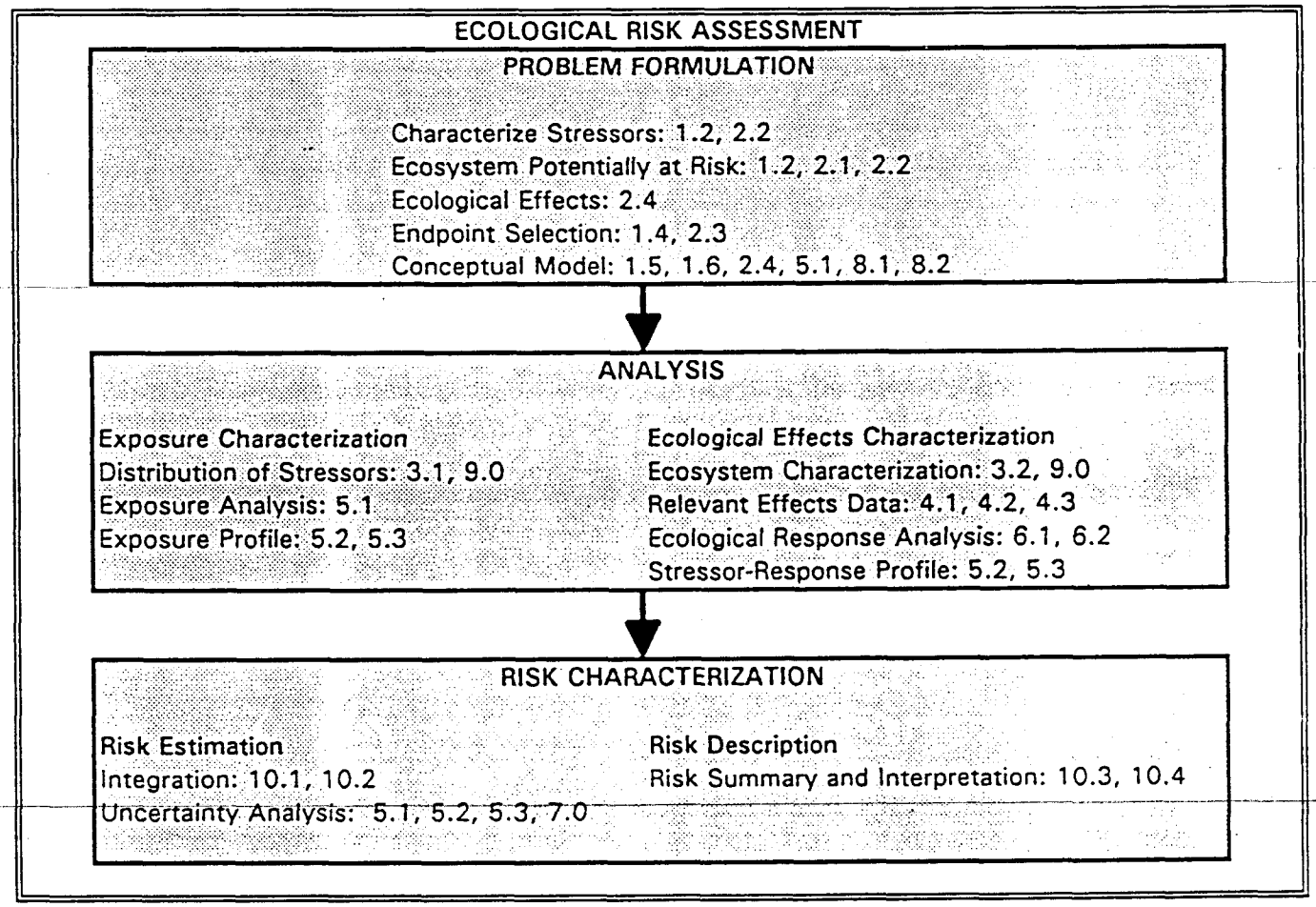
1. Overall Approach

2. Problem Formulation
   a. conceptual exposure model
   b. key receptor species
   c. study design

3. Exposure Assessment
   a. approach
   b. methods

4. Contaminants of Concern selection
   a. criteria
   b. data to be used

CORRESPONDENCE BETWEEN OU 6 EE WORKPLAN SUB-TASKS AND EPA's "FRAMEWORK FOR ECOLOGICAL RISK ASSESSMENT" (1)



OPERABLE UNIT NO. 6 -- WALNUT CREEK PRIORITY DRAINAGE
PHASE I RFI/RI ENVIRONMENTAL EVALUATION

OU 6 SETTING:

1. SOURCE DRIVEN -- (Suter 1993)
   - Known source area(s)
   - (Unknown contaminants)
   - Unknown exposures
   - Unknown effects

2. SOURCE AREAS -- OU 6 IHSSs include primary and secondary source areas

3. CONTAMINANT TRANSPORT MECHANISMS -- The primary mechanism for transport of contaminants away from primary source areas is hydrologic

APPROACH:

1. SCREENING-LEVEL RISK ASSESSMENT -- contaminants are unknown, therefore a focussed investigation of specific contaminant effects is not possible. Exposures and potential toxicities will be estimated on the basis of concentrations of chemicals in environmental media.

2. CONTAMINANTS OF CONCERN -- a preliminary list of COCs was developed based in available data for the purpose of identifying target analytes for tissue analysis. This list is subject to modification based on results of abiotic and biotic sampling.

3. ENDPOINTS -- general ecological endpoints, and chemical concentrations in tissue and abiotic media were measured.

ASSESSMENT ENDPOINTS:

1. DECREASED ABUNDANCE OF KEY RECEPTORS
2. INCREASED MORTALITY OF PROTECTED OR RARE SPECIES
3. ALTERATION OF COMMUNITY STRUCTURE
4. GROSS TOXICITY OF MEDIA

EXPOSURE POINTS --

- soils in IHSSs
- downgradient soils
- surface water in Walnut Creek drainage, including A- and B-series detention ponds
- sediments in Walnut Creek drainage, including A- and B-series detention ponds
- vegetation subject to contaminant uptake or deposition
- potential aquatic and terrestrial prey species subject to contaminant uptake from surface water or vegetation

UPTAKE MECHANISMS -- (EXPOSURE ROUTES)

- absorption across external body surfaces
- ingestion of surface water
- ingestion of vegetation and animal material

EXPOSURE ASSESSMENT -- KEY RECEPTORS

Selection Criteria

Because of the great diversity of plants and animals it is impractical to evaluate exposures for all possible receptors. Therefore exposures will be estimated for a representative group of receptors. These taxa, or key receptors, were chosen according to the following criteria:

- the taxon should occupy key positions in the local food web or be representative of key functional groups within the food web
- sufficient life history data are available to estimate diet composition, daily dietary intakes, and daily ingestion of water. In addition, information on seasonal habitat use and home ranges is needed to estimate the proportion of food or other resources that may be obtained from the OU 1 area.
- information is available to evaluate the potential effects of toxic exposures to OU 1 COCs
- the receptors have some sociological importance, or directly affect a group that does (Suter 1989, 1993).

Key Receptor Species for OU 6 Environmental Evaluation

Common Name	Scientific Name
Vegetation	in general
Soil Invertebrates	in general
Deer Mouse	*Peromyscus maniculatus*
Meadow Vole	*Microtus pennsylvanicus*
Prairie Vole	*Microtus ochrogaster*
Mule Deer	*Odocoileus hemionus*
Coyote	*Canis latrans*
Red-tailed Hawk	*Buteo jamaicensis*
Great Horned Owl	*Bubo virginianus*
Largemouth Bass	*Micropterus salmonoides*
Species of special concern	
Bald Eagle	*Haliaeetus leucocephalus*
Preble's Jumping Mouse	*Zapus hudsonius preblei*

Exposure Estimation

Direct Exposure. Direct exposure to contaminants in environmental media was estimated from the chemical concentrations of COCs measured in soils, surface water, and sediments. Data from

- surficial and subsurface soil sampling associated with Phases I, II, and III RFI/RI sampling at OU 6
- surface water monitoring program
- analysis of sediment samples collected during the OU 5 Phase I RFI/RI

Statistical distributions for data were determined and used to determine potential direct exposures. The potential toxicity of exposures were evaluated by comparison with benchmark values derived from regulatory statutes and scientific literature.

Ingestion. Exposure due to ingestion of contaminated food and water was estimated from COC concentrations measured in samples from OU 6 and estimates of daily ingestion rates of food and water. Typical diet composition were derived from the literature on each of the selected species or taxonomic groups. Daily ingestion rates of food and water were scaled to organisms size and estimated from equations presented in Nagy (1987) and Calder and Braun (1983). Estimates of daily ingestion of material from the OU 6 area also included an adjustment for the proportion of time spent in the OU 6 area, and estimated assimilation efficiency of ingested chemical. Assimilation efficiencies were determined from the scientific literature. If no reliable estimate was available, it was assumed that a = 1.0. Exposure due to ingestion was estimated using the equation:

$$\text{Daily intake} = \frac{[((FIR * C_f)*a) + (WIR * C_w) + (SIR * C_s)] * SU}{BW}$$

where:
FIR = daily food ingestion rate (mg/kg/da)
WIR = daily water ingestion rate (L/da)
SIR = daily soil or sediment ingestion rate (mg/kg/da)
C_f = concentration of COC in food (mg/kg)
C_w = concentration of COC (dissolved) in water (mg/L)
C_s = concentration of COC in soil and/or sediment (mg/kg)
a = assimilation efficiency
SU = site use factor; the proportion of the daily intake obtained from the OU 6 area
BW = body weight (kg)

The ingestion of a chemicals in food includes the amounts obtained from the major groups of food ingested from OU 6. Total daily intake due to ingestion of food was estimated from the equation:

Indirect Exposure Due To Biomagnification. Certain organic contaminants such as PCBs and other non-metabolized organic compounds tend to biomagnify, resulting in maximal exposures to top consumers in the local food web. PCB concentrations were not measured in biological tissue Because their presence was not anticipated prior to OU 6 field investigations. Therefore, biomagnification potential was estimated for PCBs using soil concentrations and a method adapted from Thomann (1981) and Fordham and Reagan (1991). The method assumes literature values for bioaccumulation of PCBs from soils and adjusts the total intake of upper consumers according to site use factor and the area in which PCBs were detected. Biomagnification is estimated as:

$$BMF_i = BAF_i + f_i(BAF_{i-1}) + \ldots + (BAF_1)$$

where:
BMF_i = biomagnification factor for level *i*
BAF_i = bioaccumulation factor for level *i*
f_i = "food term" for level *i*

The "food term" is incorporated to adjust the concentration factors for daily ingestion rate, assimilation efficiency, and site use. The term *f* was calculated as:

$$f_i = \frac{a^* R_i^* SU}{ER}$$

where:
a = assimilation efficiency as above
R_i = daily ingestion rate of food item *i* (g ingested/g body weight/da)
SU = site use factor as above
ER = elimination rate for the COC of concern (loss rate, per day)

NOTE: **MINOR ADJUSTMENTS TO THE ABOVE METHODS MAY BE NECESSARY DUE TO THE CONTAMINANT CHARACTERISTICS OR DISTRIBUTIONS**

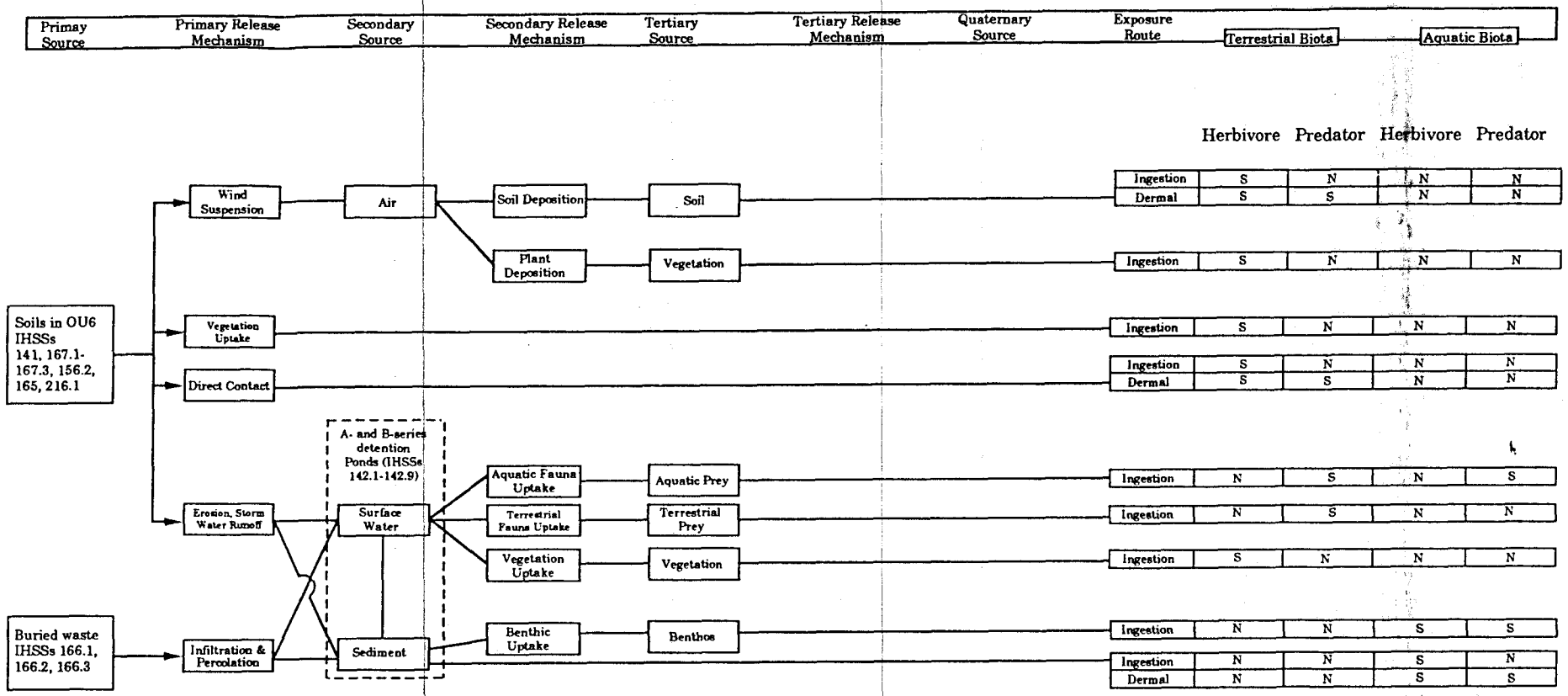
Table 4. Preliminary Contaminants of Concern for the OU 6 Environmental Evaluations

Organics
semivolatile components
Metals
beryllium*, cadmium*, chromium*, copper*, lead*, mercury*, zinc*
Radionuclides
americium*, plutonium*, uranium*, strontium*

*Target analyte

Table 5. Summary of Data Quality Objectives for Operable Unit No. 6 Environmental Evaluation

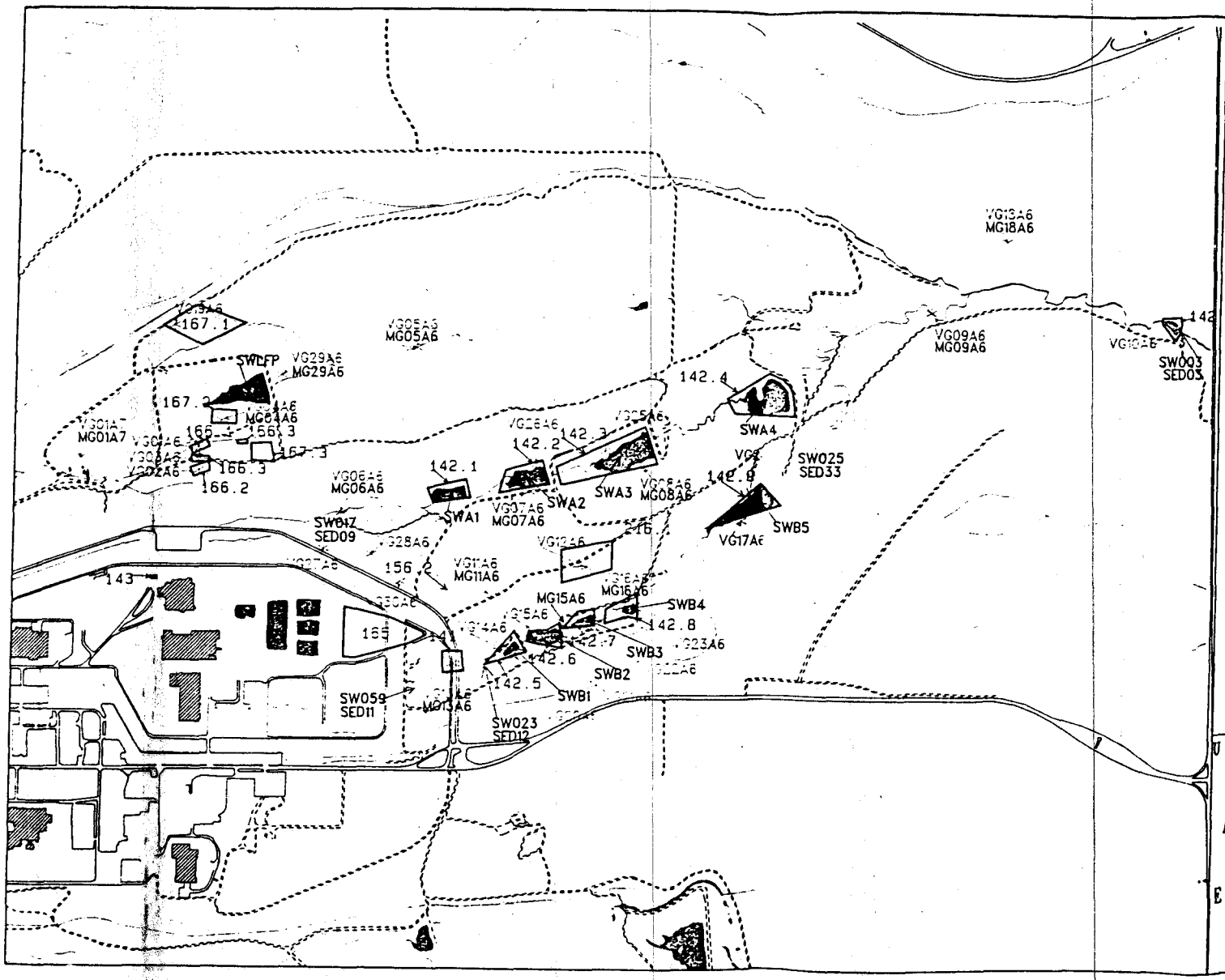
Exposure Point	Data Needed	Data Exist	Data to be Collected	Data Collection Program
IHSS Vegetation	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation
IHSS Small Mammals	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation
IHSS Soils	Soil Concentration	N	Y	OU 6 RFI/RI Abiotic Sampling Program
IHSS Sediments	Sediment Concentration	N	Y	OU 6 RFI/RI Abiotic Sampling Program
IHSS Surface Water	Surface Water Concentration	Y	Y	OU 6 RFI/RI Abiotic Sampling Program
Downgradient Vegetation	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation
Downgradient Vegetation	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation
Downgradient Soils	Soil Concentration	N	Y	OU 6 RFI/RI Abiotic Sampling Program
Downgradient Sediments	Sediment Concentration	Y	Y	OU 6 RFI/RI Abiotic Sampling Program
Downgradient Surface Water	Surface Water Concentration	Y	Y	OU 6 RFI/RI Abiotic Sampling Program
Fish in IHSS Surface Water	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation
Crayfish in IHSS Surface Water	Tissue Concentration	N	Y	OU 6 RFI/RI Environmental Evaluation



Legend
S Significant Potential Exposure Pathway (Conceivable and Relatively More Important)
N Negligible and/or Incomplete Exposure Pathway (Unlikely to Occur)

M65\ES\WM\EXP. PTHWY OU6.MDW, 3\31\93

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant, Golden, Colorado
OPERABLE UNIT 6 PHASE I RFI/RI ENVIRONMENTAL EVALUATION
Figure 1 Conceptual Site Model



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MAP LEGEND

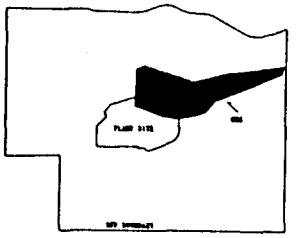
142.2 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE BOUNDARIES AND IDENTIFICATION NUMBERS

STREAMS, DITCHES DRAINAGE FEATURES

PAVED ROADS

DIRT ROADS

* VG08A6 — VEGETATION AND SMALL MAMMAL SAMPLING SITES



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Rocky Flats Plant, Golden, CO

AQUATIC AND TERRESTRIAL SAMPLING SITES FOR OU6 ENVIRONMENTAL EVALUATION

Figure 1